U.S.
INDIAN
IRRIGATION
SERVICE.
DISTRICT Nº 5

ANNUAL REPORT

1918

H F ROBINSON
SUPERINTENDENT
OF
IRRIGATION

Albuquerque N.M.

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CV-6417-201 NN012868

Annual Report
Fiscal Year 1918
H. F. Robinson, 5-1143
Supt. of Irrigation.

DEPARTMENT OF THE INTERIOR

UNITED STATES INDIAN IRRIGATION SERVICE

SUPERINTENDENT OF IRRIGATION

CHIEF ENGINEER, RECEIVED JUL 24 1918 U. S. INDIAN SERVICE

Albuquerque, N. M., July 1918.

Mr. W. M. Reed,
Chief Engineer, Indian Irrigation Service,
Department of the Interior,
Washington, D. C.

Dear Mr. Reed:

I herewith submit my annual report for the fiscal year 1918 covering the operations in district No. 5.

THE DISTRICT

This district, as is shown on the accompanying map, comprises the States of Colorado, New Mexico, the northern half of Arizona and a small part of Utah, and includes the following reservations and pueblos:

RESERVATIONS	PUEBLOS
Navajo	Taos
Hopi	Picuris
Zuni	San Juan
Havasupai	Santa Clara
Mescalero Apache	San Ildefonso
Jicarilla Apache	Nambe
Southern Ute(Allotted)	Teseque
Ute Northern	Cochiti
Allotted Navajo Indians (Pueblo Bonito)	Santo Domingo
	San Felipe
Canoncito Navajo	Sandia

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GANADO PROJECT, NAVAJO RESERVATION.

This project is for the construction of a reservoir about three miles from Ganado, Arizona, in which the waters of the Rio Pueblo Colorado may be conserved, together with the construction of the necessary diversion structures and canal, and the distributing canal. On a flat north of the stream is a small storm water lake which has existed for many years, and by the construction of a dyke about 3200 ft. long with a maximum height of 22 ft. a considerable quantity of water can be impounded and used for the irrigation of lands along the stream below.

A number of years ago Mr. J. L. Hubbell, who owns by patent a tract of land in the Reservation, had appropriated all of the waters of this stream and constructed a canal. When this project was contemplated Mr. Hubbell made a contract with the Indian Office by which he turned over to the Government all of his rights to the waters of the stream and the ditch that had been constructed, receiving in return reservoir rights

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to the amount of 400 acre feet per annum. His agreement with the Department further contained a provision that he would do or have done the annual cleaning of the ditch from the reservoir to his ranch each year at no cost to the Government.

From the time the construction of this system was proposed much trouble and damage has been experienced because of floods and storms which have delayed construction and increased its cost over the amount originally contemplated. Before construction was commenced, after the plans were made, the stream shifted its channel making it necessary to build a large diversion dam, which was not originally contemplated. Flood waters in the creek have done more or less damage to the head works, and cloudbursts on the side drainage have carried out two large flumes after they were constructed, and washed out the ditch in many places. A year ago ice movement on the reservoir destroyed the outlet tower and gate, but all of these damages have been repaired and the project is in shape to irrigate land through the

entire length of its constructed ditch.

The reservoir dyke has been carried up to an elevation of 19 ft., the canal excavated and all structures built.

During the past year in addition to the ordinary operation and maintenance work, three stone drops have been constructed, five steel flumes have been built, a metallic chute to carry the water down a steep hill has been installed, one drainage culvert built under the canal, nineteen wasteways have been placed in the canal at various points to relieve it of surplus storm waters; flumes No. 5 and 6 have both been rebuilt, a new outlet gate installed at the reservoir, and the spillway lift at the diversion dam has been repaired (See photos).

The Indian appropriation bill for 1919 appropriates $20,000. for further work on this project. All of the work that it is proposed to do has not been worked out in detail, but will be submitted as a special report as soon as possible. The first work proposed to do, however, is to carry the storage dyke from its present height at 19 ft.

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to the finished height of 22 ft. Surveys will then be made for the extension of a ditch on the north side of the stream, but until the surveys are completed no details can be given.

Quite a number of Indians are farming small tracts of land this year, and more would undoubtedly be doing something if they could be assured that the tracts would be allotted to them after they commenced their improvements. So far, I have heard of no action being taken by the Indian Office or by the Superintendent in charge to allot any Indians on this tract or to give them any encouragement in settling there. A tract of about 270 acres has been reserved by a notice posted on the ground, "For a School Farm", warning the Indians to keep off. Until some action is taken looking towards the encouraging of the Indians to settle on the lands under this project, not much will be done. I have directed our Foreman in charge to tell any Indian who wished water, that it would be furnished to him, but no assurance could be given him that he could remain on the land more than from year to year, and that

for any permission to remain on the land he must see his Superintendent at Fort Defiance. This has deterred many from settling on the ground that they did not care to clear and level a tract of ground that might be taken away from them at any time.

If the Office desires immediate settlement of this land, I would respectfully suggest that a farmer in charge be located here, and he be given authority to make tentative allotments to the Indians with full assurance that they would either be allowed to remain there or that they would be reimbursed for any improvements they might make in case the land was allotted to somebody else.

MARSH PASS PROJECT

The Marsh Pass project is a small one in the Navajo Reservation north of the Black Mountain district. This point is about ninety miles north of Tuba or about 180 miles from Flagstaff. It is 175 miles northwest of Gallup, New Mexico, and 130 miles due west from Farmington, New Mexico. The road from the latter point is almost impassable, and the usual method of reaching the project, and the line over which the weekly mail is carried, is from Gallup. The elevation is about 6000 feet and the average annual rainfall is from seven to eight inches. The post office is Kayenta. At this point a small boarding school is located, and the surrounding country is well populated by Navajos.

The project is to divert water from Laguna Creek, which has a normal flow of from six to ten feet and a flood flow of considerable magnitude.

The water is diverted from this creek by a rock-filled crib dam and carried a couple of miles to an old lake bed, which, by the building

of a small earthen dam, forms a storage and equalization reservoir. The water is released from this reservoir into a natural channel, and is again diverted some distance below, into a ditch some three miles long. This ditch with its present construction covers something over 500 acres of land, and by the construction of a small extension and some laterals will cover over 1000 acres at a small cost.

During the year work was resumed on this project with the expectation of completing it. The dam was built and practically all of the construction completed with the exception of the excavation of a few hundred feet of the canal and the placing of two small flumes. About this time the Indians commenced their harvest dances, and it was impossible to get any labor at that time, and the engineer in charge having had other work offered him, resigned, and owing to the difficulty in securing engineers and skilled men work on the project was not resumed. It is proposed to get an engineer on the ground early in July and get the project finished. It is estimated

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that $600. will be sufficient to do the rest of the work.

In its present condition the diversion and upper works are completed and the reservoir is practically full of water, and if labor can be secured, a month's work should put it in good shape to run water the entire length of the ditch and supply any of the land lying under it.

By authority from the Indian Office, as soon as the project is completed it will be turned over to the Superintendent of the Western Navajo Agency for future operation and maintenance, the project being too small to justify the expense of the Irrigation Service keeping a man there for that purpose.

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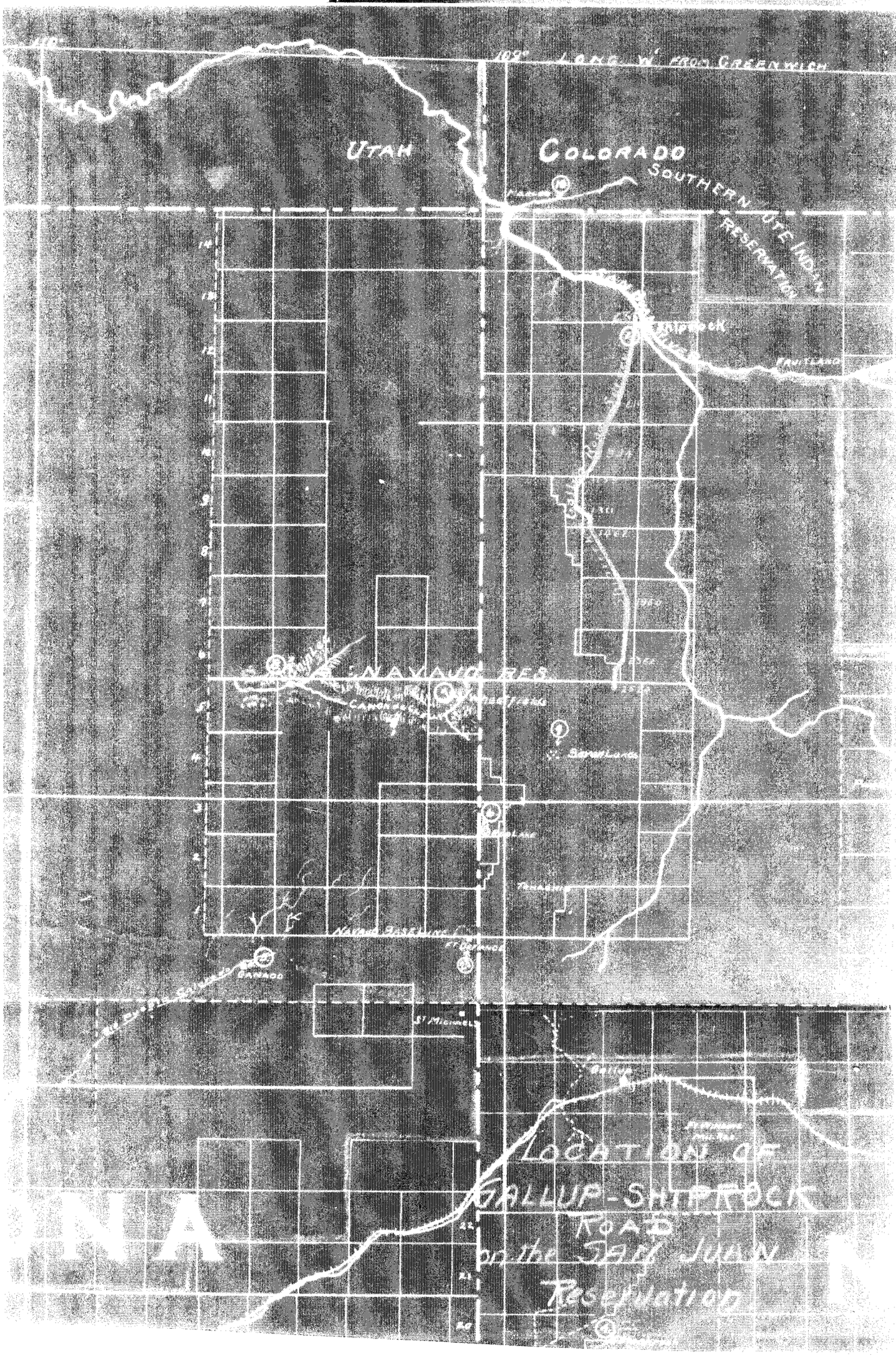
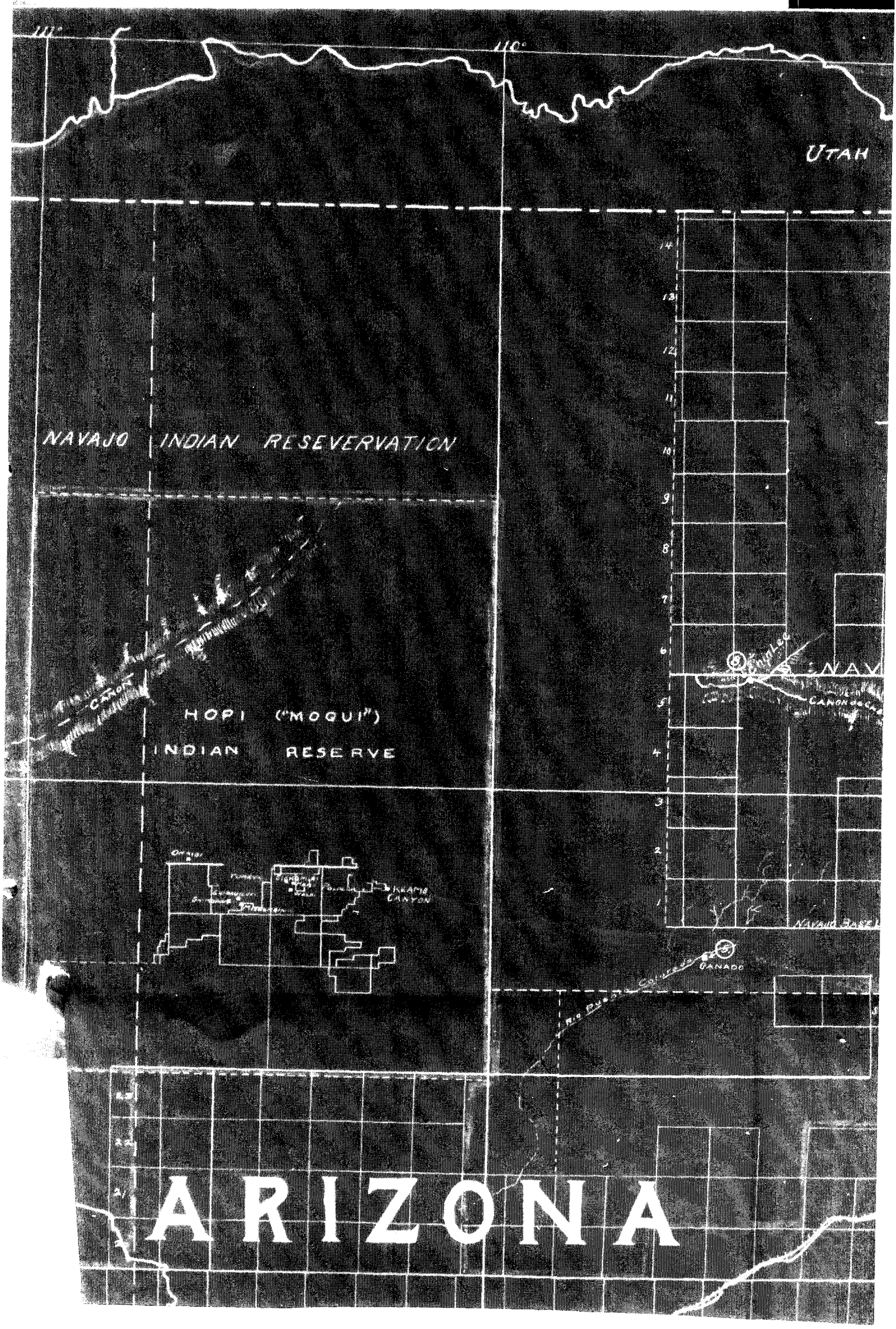

109° LONG. W. FROM GREENWICH
UTAH
COLORADO
SOUTHERN UTE INDIAN RESERVATION
SHIPROCK
FRUITLAND
NAVAJO RES.
CANONCITO
ST. MICHAELS
GALLUP
LOCATION OF
GALLUP-SHIPROCK
ROAD
on the SAN JUAN
Reservation


111°
110°
UTAH
NAVAJO INDIAN RESEVERVATION
HOPI ("MOQUI")
INDIAN RESERVE
CANADO
ARIZONA

UNDERGROUND WATER DEVELOPMENT

The Navajo and Hopi Reservations while not absolute deserts, are probably about the driest part of the United States, having a very scanty rainfall which is distributed very irregularly throughout the year.

The greater part of this area is of a character on which the average white man would be unable to more than exist although the Indian population, who for generations have been living here, not only make a precarious living but in some cases what would be considered a competency by white men. While the rainfall is very scanty it is sufficient to bring to maturity grass and other vegetation in most parts of this country which, in ordinary years, forms good grazing for a few months. The conditions which go to make this a grazing country is not the feed primarily, but the water supply. Large portions of these reservations have no natural water other than an occasional seep or a water hole which exists for a short time after the melting snows in the spring

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or storms at other times of the year. It is the quantity and distribution of water that sets the limit for the size of their flocks and herds.

For the past seven or eight years the Indian Irrigation Service has been trying to increase the water supply of these reservations both for the stock and domestic supply, for at times of shortage of water the Indians are obliged to use water that is absolutely unfit for domestic consumption and even for stock purposes.

We have recognized the fact that a proper water supply for a grazing country involves not a few large supplies, but many small ones; that it is not necessary to increase the supply at points where water already exists, but to try and develop it at other points where there is grazing but no water.

In considering the development of water at places, it must be borne in mind that too great a quantity at any one place, when there is a scarcity at others, will naturally cause that part of the range to be overstocked; and as at no place is the grass very luxurious, there is great

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Navajo Sheep at the water hole formed by the overflow of an artesian well.

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danger of entirely destroying all of the feed near the water, by overgrazing and tramping it out.

Stock grazing, especially the raising of sheep on these reservations, has proved the salvation of the Indian. They are natural herdsmen and for a number of years their flocks have increased to about the maximum figure that natural water would supply, although the limit of grazing had not nearly been reached. The natural increase of the flocks would reach a maximum quantity, then there would be a season of drouth and the mortality would be very great, reducing the flocks to the number that could exist on the diminished water supply.

The work that we have been doing under the name of Underground Water Development consists of (1), deep well drilling (on wells over 300 ft.), which has been for the purpose of exploring for, or developing, artesian flows, (2) shallow well drilling (or depths less than 300 ft.) in the Navajo and Hopi country, (3) the well maintenance, (4) the development of springs and water holes,

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and (5) the drilling of shallow wells for the Pueblos.

After a couple of years' work in exploring for water to depths above 1000 ft. under the direction of the Geological Survey, it was demonstrated that artesian water could not be found in the Hopi country, but it was found in the eastern part of the Navajo Reservation north of Gallup. In this latter location, known as the Choiska Valley, good wells have been developed at from 205 to about 550 ft., but the work has been very slow owing to the formation in which we had to work, the greater part of the depth being through a fire clay which works up into the consistency of tough putty, and will neither drill nor bail out excepting with the expenditure of a great deal of work and time.

During the past year only two rigs have been in operation in the Navajo and Hopi country since September. Rig No. 1, putting down the artesian well, has not accomplished as much as it was hoped or that it should have done. In the first part of the fiscal year we changed the power from steam

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A miracle of the Indian Service.
Finding water in the Desert.
An Artesian Well.

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to an internal combustion engine, and the driller claimed it was necessary to make rather extensive alterations in the rig and its connections on this account. While working on well No. 120 a fair flow of water having been developed, the entire flow was lost underground through encountering a very porous strata, and it took some time to recover the flow. This was done by filling the hole with concrete, until the entire pervious strata was covered, and then redrilling a hole through the concrete. About the 1st of April the string of drilling tools became stuck in the hole, and after working the entire month of April, the driller gave it up, quit the job and left for California. A new driller was finally secured and reported on the job about the 25th of June, and after working several days reported that the hole contained not only the original drilling tools but 150 ft. of steel cable, and that a fishing tool with about 300 ft. of steel cable had also been lost in the well and that it would be impossible to do anything with it and the hole would have to be abandoned. Before the tools

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were lost in the well, however, artesian water had been encountered and a small flow of 30 to 40 gallons an hour was running over the top of the pipe, so that the hole will not be entirely thrown away, as a flow of this amount will water quite a number of sheep and cattle.

It is hoped that the poor showing made during the past year will be overcome by the new driller. The former man, while a good driller, I believe had become rather inefficient from being on the one job too long, with very little immediate supervision, for it was necessary, of course, that he be thrown entirely on his own resources most of the time. With a new man, who has a record to make, I believe it quite probable that the results will be different.

Rig No. 3 was only in operation a short time, completing one well in the northern part of the Navajo Reservation lying about fifteen miles east of Kayenta. This well developed a small artesian flow, 30 or 40 gallons an hour, although on a test using a pump, 450 gallons an hour was easily secured. Owing to having insufficient money to run the three

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rigs and the operation and maintenance work for the entire year, this rig was then laid off and is stored at Kayenta at the Government School.

Well Rig No. 4 has made a very good record for itself and for the driller during the year. At the beginning of the fiscal year they were working on well No. 458, which was completed shortly thereafter. Under authority from the Indian Office the use of the rig was then loaned to Mr. Lorenzo Hubbell to put down a well at a trading store in that vicinity, Mr. Hubbell agreeing to pay all of the expenses of drilling and moving the rig both to his place and back again and agreeing to furnish the Indians with all of the surplus water over and above his needs, for stock purposes. After that, thirteen other wells were put down along the south edge of the Black Mesa and swinging down towards Oraibi Mesa and Wash; and after reaching Oraibi it was found necessary to develop some more water near the mouth of Keams Canon both for the use of the Indians and in order that water might be available for a sheep dip, and the rig was moved there and a number of holes put down,

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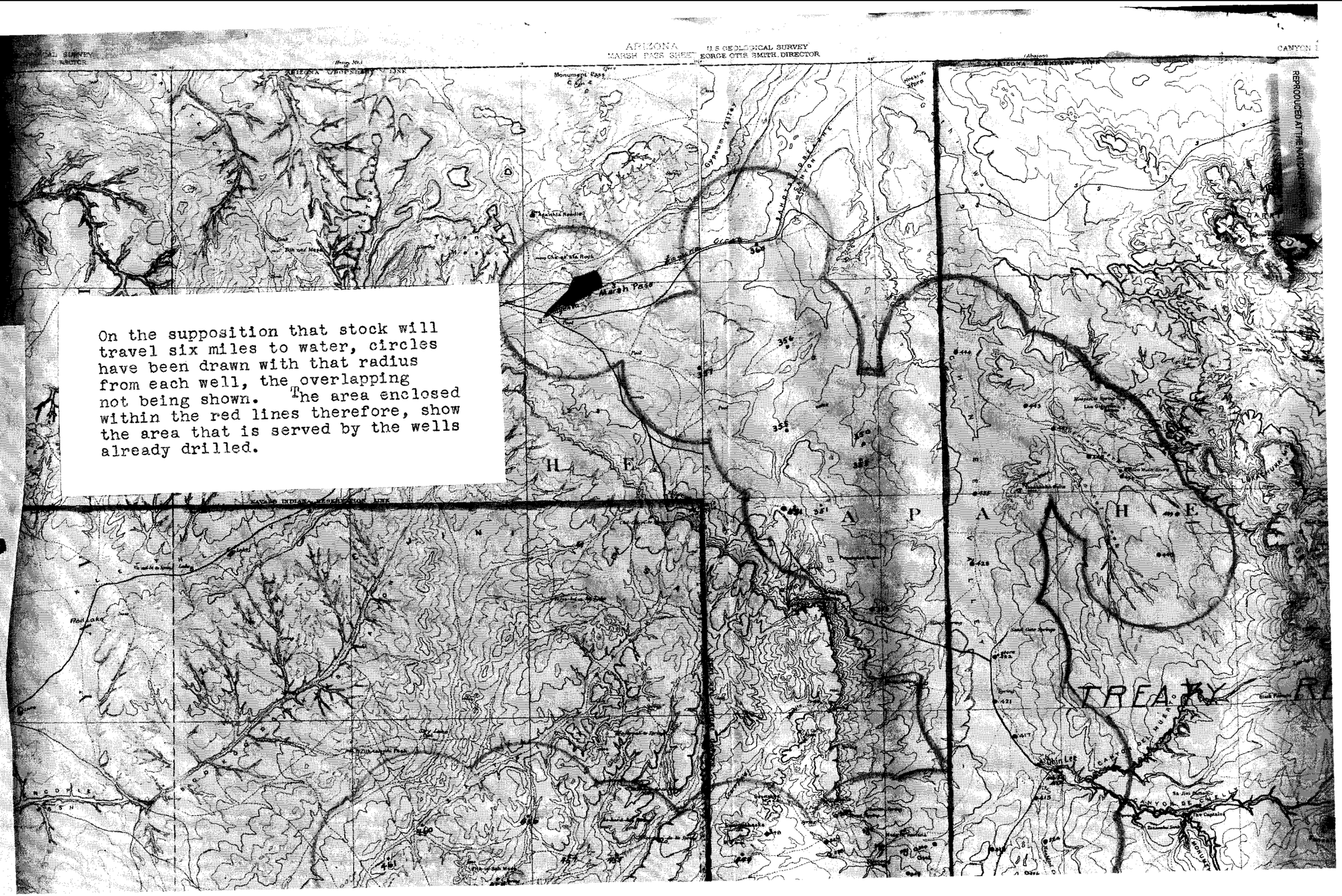

On the supposition that stock will travel six miles to water, circles have been drawn with that radius from each well, the overlapping not being shown. The area enclosed within the red lines therefore, show the area that is served by the wells already drilled.

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ARIZ-N.M.
CANYON DE CHELLY SHEET
NEW MEXICO
CHACO SHEET
MEXICO (BOUNDARY LINE)
HOGBACK
Imprack
PROJECT
Farmington
Fruitland
Waterflow
Sulphur Spring
Shiprock
Tohatchi
Mexican Water
Chinle
Ganado
Sanders
Teec Nos Pos
Tuba City
Leupp
Moenkopi
Cameron
Flagstaff
Winslow
Holbrook
Navajo
Ft. Defiance
Window Rock
Gallup
Zuni
Thoreau
Grants
Cuba
Jemez
Bernalillo
Los Lunas
Belen
Socorro
Magdalena
Datil
Quemado
Springerville
Alpine
Eagar
Vernon
Chama
Tierra Amarilla
Dulce
Lumberton
Tres Piedras
Ojo Caliente
Española
Pojoaque
Santa Fe
Cerrillos
Galisteo
Las Vegas
Mora
Wagon Mound
Springer
Raton
Cimarron
Maxwell
Ft. Wingate
Ft. Defiance
Ft. Wingate
Ft. Sumner
Ft. Stanton
Ft. Bayard
Ft. Selden
Ft. Cummings
Ft. Bliss
Ft. Sill
Ft. Leavenworth
Ft. Riley
Ft. Hays
Ft. Dodge
Ft. Lyon
Ft. Garland
Ft. Lyon

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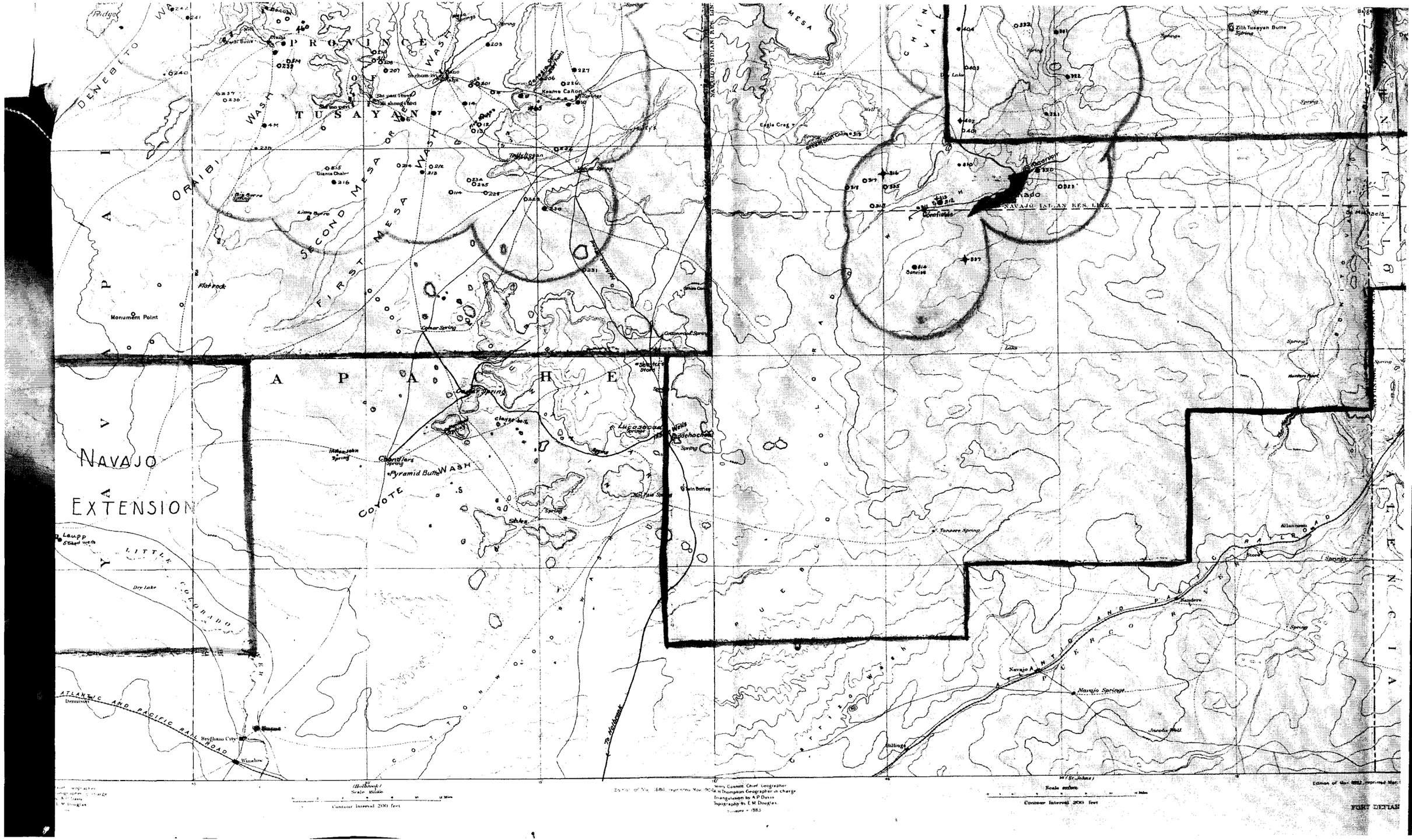

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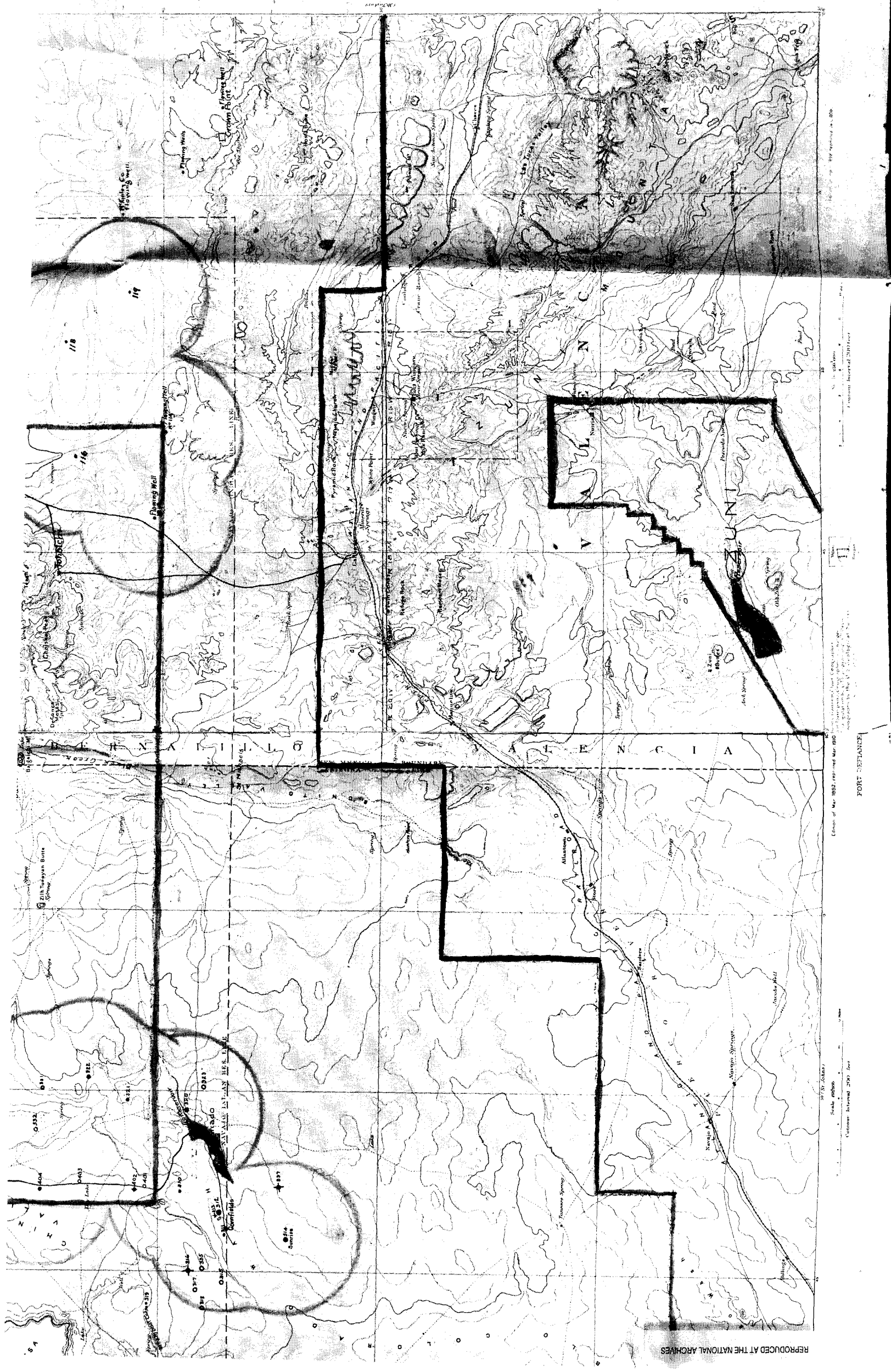

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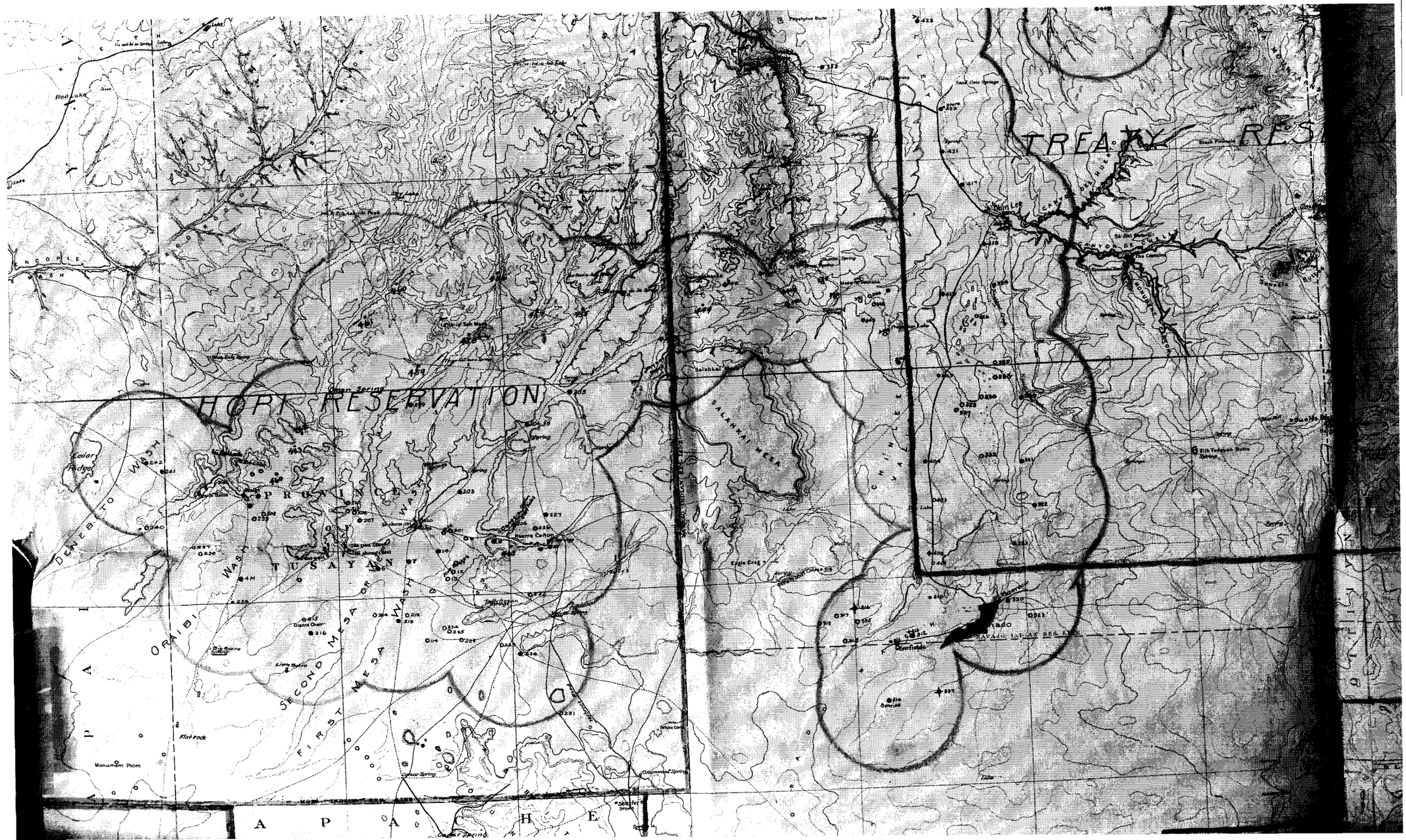

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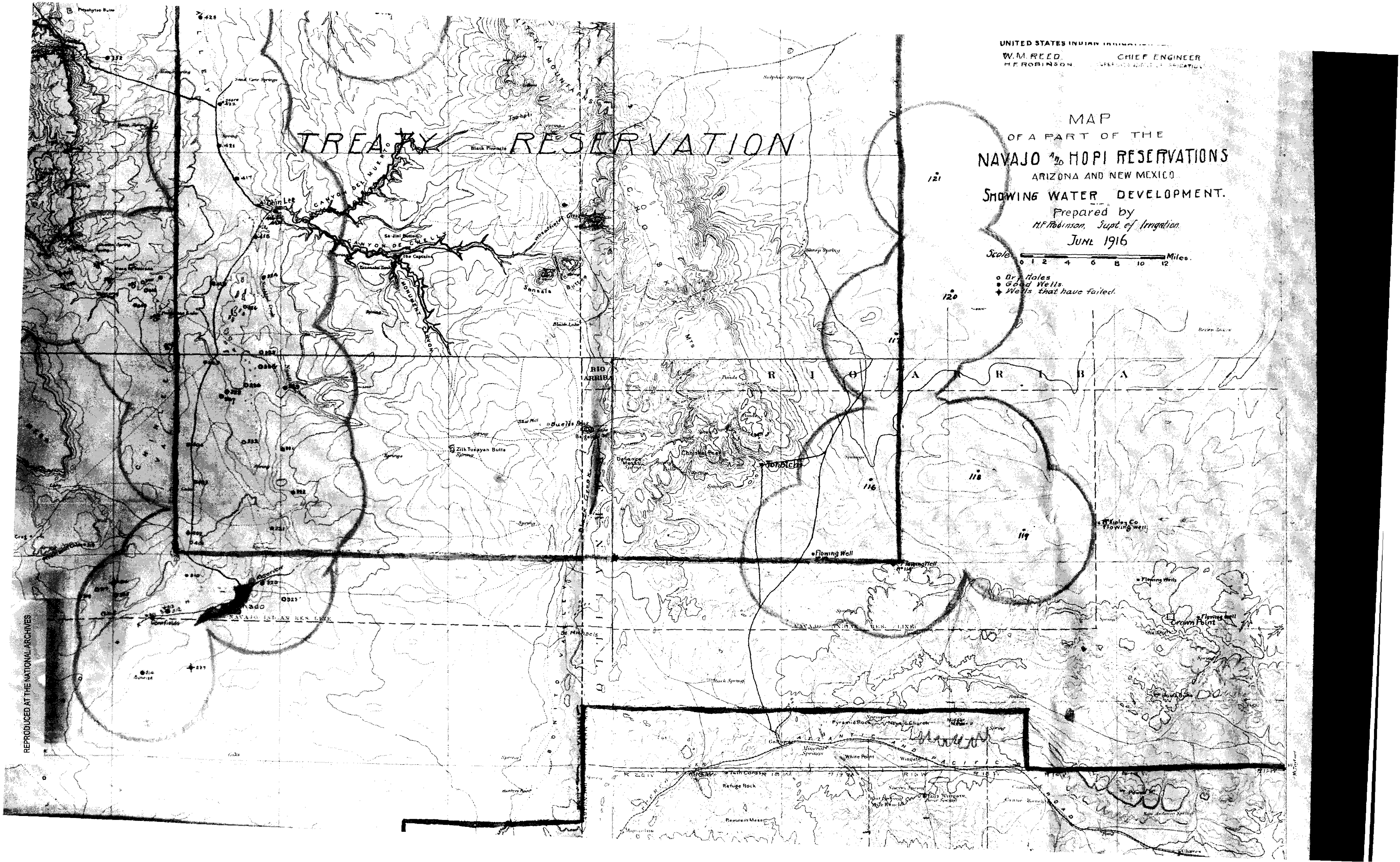

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six of which failed to develop water. The following is a list of the wells put down during the year:

Well No.	Depth	Quantity of Water
458	208 ft	150 gal.
Hubbell Well*	223	180
459	134	360
460	138	600
461	139	720
462	125	No water
463	138	200
464	100	1100
465	70	Dry
466	75	"
467	92	"
468	55	"
469	115	"
470	64	"
471	84	Quantity not tested

In addition to drilling these new wells several of the old wells needed working over, and this was done at wells 239, 4, and 9.

The past year with its extreme drouth has demonstrated to both the Indians and the Service the great value of this underground water development. I have been familiar with the Navajo country since 1904, and this has been the driest season during these years. All of the water holes have dried up, a few supposedly permanent lakes now have no water, and many of the springs and seeps

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have failed. There is one lake, lying between Ganado and Chin Lee, that has a length of about a mile and a half and a width of a quarter of a mile or more during the ordinary seasons, and which has never been known to go dry to my knowledge, has been absolutely dry this year, and were it not for the wells we have put down in the vicinity much stock would have been lost already. In a report from Foreman Womack he makes the statement that "had it not been for the wells already put down a large number of the Navajos and Hopis would have been out of the stock business eight months ago."

In order to get the opinion of those who are in a position to know the conditions and the needs of the Indians, I had Foreman Womack send out letters to many of the traders and missionaries on the Reservation asking them to give their unbiased opinion as to the value of the work being done. The universal reply was that it was the best thing that the Government had done for the Indians, and the only objection they had to the program was that we were not putting down enough wells or covering

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the ground fast enough. Copies of these letters were made and sent to the Indian Office as a special report with the statement that they might be valuable in bringing to the attention of Congress the needs of this district for a greater amount of money to carry on the work. Copies of these letters will be found at the end of this report.

When the program for this water development was made up Congress gave us $25,000. a year, and this was sufficient to run four rigs. It was found, however, that as fast as the wells were drilled and equipped, the Irrigation Service must look after their maintenance and operation, for the Indians were absolutely unable to do the work, and in this country of sand and drouth the high winds would wreck the mill or blow the bearings full of sand, and unless constant watch was kept the well would soon be out of commission and the money expended in them would be worse than lost. As the line of wells was extended it was necessary to put on parties who did nothing but look after the maintenance and at the present time we have

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two such outfits, one with headquarters at Chin Lee, and the other at Polacca. To make the round of all of these wells once will necessitate a travel of between 500 and 600 miles, and it will readily be seen that with this amount of travel and the visiting of every windmill at least once a month, together with the time necessary to make the repairs and inspect the mills, will take all of the time of the two outfits. This maintenance work together with the great increased cost of pipe, tanks, windmills and all other material that goes to make the equipment for each well, makes the $25,000. entirely inadequate to extend the work as rapidly as it should be, and as a result we are now only able to keep two rigs going and the two maintenance crews, and do a small amount of spring development work and other work of that character.

The Indians are very anxious to have the well work extended as rapidly as possible, and in most sections of the country they are cooperating in every possible way, are furnishing teams to help the moving of the rig, hauling wood and water,

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and doing other work of a like nature without charge, for they feel that they are being benefited to such an extent that they can donate both time and labor in helping the work along.

We are constantly receiving requests from the Indians on various parts of the reservations for wells in their section, either through the Indians visiting the rigs personally, or by means of letters written for them. To all we can only say that we will get to their section as soon as possible, and the speed in arriving will depend on the amount of money available for the work.

The condition most affecting the water development has been the unusual dry weather, which has made it absolutely necessary to give continuous attention to the maintenance, as the wells have been the only dependable source of water for all of the Indian stock and his domestic supply as well.

Under date of June 30 Foreman Womack writes that there have been a few local showers which relieve the situation a little, and that since the showers the grass is beginning to show a lit-

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tle green and that "this is the first sign of there being any growth of the grass this year, and this over a territory as big as five or six of the eastern states". He goes on to say that if the usual summer rains come there will be scanty feed for the stock next winter, but if it fails, the Indians will lose practically all of their stock.

As a consequence, the range has been greatly overtaxed around the wells as practically all of the stock has been brought to the only water in the country, and the Indians have had a magnificent demonstration of the superiority of the white man's civilization over theirs and those who were disposed to object, fearing the encroachment of the whites are now not only willing but glad to take advantage of what has been done for him.

Mr. Womack has persuaded the Indians in many localities to put small dams in depressions to catch any possible rainfall that the stock may be moved back from the wells for a time to allow the grass to grow.

For an extension of these remarks I would re-

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fer you to my annual report for last year, in which I covered the subject quite fully; but the matter is of such great importance that I feel justified in taking considerable time in putting the matter before you, and trust that the Office will see the great necessities and the vast good being done and will ask Congress for a larger appropriation for subsequent years.

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